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ABSTRACT

This planning paper reviews the topics that are pertinent to a conference action group on mathematics in adult, technical, and vocational (including distance) education. The first section of the paper provides an overview of the need for and current practices for providing mathematics instruction in vocational-technical, adult, and distance education programs. The second section discusses the impact of new technologies on the need for infusing mathematics instruction into adult and vocational programs and the importance of providing such instruction in developing nations. Both the first and second sections include information on how these topics have been covered in the past. The third section outlines the planned organization and working structure of the action group, including possible topics for each of the action group's subgroups and subgroup sessions. A list of references is also included. (MN)

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Rudolf STRAESSER

Mathematics in Adult, Technical and Vocational Education
including Distant Education

Pre-Conference Paper for
Action Group 7 of ICME 6

Occasional Paper 97 March 1988

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Structure:

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The Paper reflects the preparation of the meetings of Action Group 7 "Adult, technical and vocational education" of the 6th International Congress on Mathematics Education (ICME 6), to be held in Budapest/Hungary from July 27 to August 3, 1988.

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1. Topics of the Action Group

1.1 Mathematics in Technical and Vocational Education

Technical and Vocational Education is described by UNESCO as "the educational process ... (which) involves, in addition to general education, the study of technologies and related sciences and the acquisition of practical skills and knowledge relating to occupations in various sectors of economic and social life" /cf. UNESCO 1978, p. 17/. Technical and vocational education normally takes place after compulsory education. In different nations the institutional system of technical and vocational education varies from full time technical colleges (e.g. France) to isolated and/or part-time activities in private enterprises or colleges (e.g. England for some levels of qualification). Some nations do not even have any institution which could be named technical or vocational college.

With technical and vocational education closely related to occupations in various sectors of society, mathematics used in the various sectors was scrutinised and this activity led to interesting results: The mathematical procedures found to be used on the job center around topics such as basic arithmetic, percentages and proportions (rule of three). In most vocations, these techniques already seem to be all needed, but "conceptual skills, such as spatial awareness, the understanding of orders of magnitude, approximation and optimisation, are of equal or greater importance. ... It is of fundamental importance ... that all mathematics which is used at work is related directly to specific and often limited tasks which soon become familiar ... it is possible to summarise a very large part of the mathematical needs of employment as a 'feeling for measurement'" /cf. COCKCROFT-report, p. 15f and p. 24/.

Moreover, the studies faced considerable difficulties when trying to identify the professional use of mathematics: "Considerable differences ... were found to exist even within occupations which might be assumed ... to be similar. It is therefore not possible to produce definitive lists of the mathematical topics of which a knowledge will be needed in order to carry out jobs with a particular title" /cf. COCKCROFT-report, p. 19/. The identification of the uses of mathematics on the job are a major problem, stemming from the close relationship between mathematics and the vocational situation - sometimes making it impossible to distinguish between these two aspects of a given situation. Obviously, there is a difference between mathematics as a discipline and mathematics used at work: Mathematics as a discipline clearly limits its means to produce knowledge (e.g. by stating axioms to start from and logical principles to derive consequences). Implicitly mathematics defines by this what is included in mathematics. Quite to the contrary for "work": everything - mathematics or not - helping to cope with a given professional situation is taken into consideration - at least in principle. If a solution to a professional problem is found it will be used and improved as such. Connections to related theoretical knowledge often are cut off and forgotten. Professional solutions tend to be transformed into mechanical procedures applicable by imitation and not understanding - at least on the lower levels of the work hierarchy /for an illustrative example and more systematic elaboration of this transformation cf. DAMEROW, pp. 11-16/.

So the question of "application" of mathematics (as it is discussed in general education) becomes a new facet. For young employees or apprentices, finding the appropriate formula and/or technique to cope with a given vocational situation seems to be the most widespread difficulty when using or learning mathematics. The problem is the "application" of mathematics to the professional situation /cf. COCKCROFT-report, p. 18f/. Technical and vocational education (especially when organised along classroom lines) seems to overlook this need for learning to use mathematics in professional situations and puts too much stress on topics to be learned.

Apart from the aspects directly related to work and occupations, some more general issues are also discussed with mathematics in technical and vocational education: Mathematics is thought to be extremely helpful with the training of order,tidiness and self-criticism. Especially when organised along classroom-type activities, the relevance of the topics to continuing education are looked after. This may even lead to conflicts with the actual work practice. Sometimes, topics taught in technical and vocational education are also legitimised by their relevance for an informed, competent and responsible work force and/or citizen.

The task of a curriculum developer in technical and vocational education is additionally complicated by "important differences between the ways in which mathematics is used in employment and the ways in which the same mathematics is often encountered in the classroom" /cf. COCKCROFT-report, p. 19; for a discussion of differences between classroom-learning and knowledge in general cf. CHEVALLARD/.

Ten years ago, UNESCO formulated two major problems with technical and vocational education: First there is a the widespread disapproval of technical and vocational education - compared to "general" education. Second there seems to be a problem with the adaption of the social and economic process of production and distribution of goods and services and the preparation for this process in technical and vocational education. These problems materialise in the shortage of competent teachers and in the lack of adequate curricula and teaching/learning materials /cf. UNESCO 1978a, p. 93ff/.

1.2 Mathematics in Adult Education

Adult Education comprises all activities, where people try to broaden their knowledge and/or skills while they are already full, mature members of a society, i.e. responsible for themselves and their future. These activities are not necessarily related to earning a living. They are undertaken for various reasons as e.g. the possibility of applying for a job, the search for promotion in a job, enrichment of leisure time or philosophical interest. Institutions, goals, learning/teaching strategies, learners, teachers and curricula in adult education are even more heterogeneous than in technical and vocational education - and so are differences between nations all over the world /cf. PENGELLY, p. 86ff/. As for mathematics in adult education "the current state of the literature is unsatisfactory" /cf. PENGELLY, p. 103/. This statement of the ICME-3-Proceedings still holds true - with some minor exceptions:

A certain classification of adult education activities concerning mathematics seems to emerge, distinguishing activities aimed at fostering adults' every-day use of mathematics /cf. the ICME 4 Proceedings, p. 705ff/ as opposed to courses leading to formal certificates /cf. the ICME 4 Proceedings, p. 702ff/.

As for the subjects taught, an approach to directly transform the "needs" into curricula was also tried for adult education. The research study of the COCKCROFT-report for adult education followed these lines trying to identify the "mathematical needs of adult life". The report gives a list of needs namely "ability to read numbers and to count, to tell the time, to pay for purchases and to give change, to weigh and measure, to understand straightforward timetables and simple graphs and charts, and to carry out any necessary calculations associated with these..." /cf. COCKCROFT-report, p. 10/, what makes a reasonable list of everyday activities related to mathematics.

The Report goes on: "Most important of all is the need to have sufficient confidence to make effective use of whatever mathematical skill and understanding is possessed, whether this be little or much" /loc.cit./, bringing up a second major issue: Adult mathematics education often has to cope with the fact that its learner has already failed in mathematics or has the feeling of being a failure /cf. PENGELLY, p. 92/. Fear and feeling of failure tend to hinder learning in adult education and render even more difficult adult learning of mathematics, often already difficult because of the isolation of learning in distance education /cf. ICME-4-Proceedings, p. 703/. In some contrast to this statement, one has to bear in mind that adult education in mathematics is not only confronted with people being "handicapped" mathematically, but with many adult learners who are really interested in and competent to do mathematics.

Most of the activities in adult mathematics education seem to be taught in close integration with other subjects such as reading and science. The different subjects are even more interrelated than in technical and vocational education, which is another difficulty for a discipline-oriented approach to adult mathematics education.

1.3 Mathematics in Distant Education

This topic was not explicitly discussed in the Action or Theme Groups of ICME 5, so one has to go back to ICME 3 and ICME 4 for a continuation of this subject within the ICME-frame. In 1976, PENGELLY (following a document of the European Parliament) gave three characteristics of "distance education": "(1) spatial separation of student and teacher for all or almost all of the courses; (2) the use of teaching material in permanently recorded form, such as printed notes, films, cassetttes, radio and television; (3) teacher control and goal directedness" /PENGELLY, p. 87/. Following this definition, "distant education" is a special organisation or way of learning - and not so much a question of contents or age group.

From these characteristics, it is also evident that "distance learning is an unusual human activity, and for that reason it is difficult" /PENGELLY, p. 89/. Detailing this difficulty, PENGELLY identified three major problems for the design of learning systems in distant education /cf.

loc.cit., p. 98f/: The designer of a learning system has to cope with "diversity" both coming from different, often quite distinct purposes of the course as well as from the student's background. He also has to cope "with a relatively small number of students spread over a geographically large area" and he has to choose a "method of assessing the student's attainment and of awarding certificates".

For the process of learning mathematics, three stages are distinguished - with certain media being more or less appropriate for these stages. The Open University in the United Kingdom distinguishes "exposure: the first meeting with new material" from "experience: in greater depth and detail" and "mastery: of either technique or concept" /cf. LOVIS, p. 49/ and seems to have a clear policy concerning the media used in the respective stages. For exposure, the Open University relies on television, which "must be linked with written material", whereas - besides written material again - "the audio-cassettes are particularly useful" in the stage 2 of "experience", which is characterised by "structured questions and ... worked examples... Mastery must mean doing, i.e. routine practice." In this stage, "tutorial radio programmes seek to provide this" /loc.cit., p. 50f/. If we have a closer look to experience reported from New Zealand /cf. KNIGHT/, we find a similar pattern of stages, but a somewhat different use of media. Here may be an issue for discussion in the subgroup of AG 7 on distant education.

The use of new technology such as computers and video cassettes seems to imply certain problems in distant education. Even in a relatively prosperous country like New Zealand, students do not have easy access to these new communication technologies. In addition to that, the great variety of standards used with these media and the incompatibility of the software is a major hurdle to use in distant education /cf. KNIGHT, p. 72/.

2. Key Issues

2.1 Impact of New Technologies

Computer-based information processing and communication technology can influence distant, adult, technical and vocational education in two possible domains: On the one hand, new technology can be used as a teaching aid, on the other hand there are changes stemming from the growing use of new technology in every-day life and vocational/professional situations.

Studying the use of new technologies as teaching aids, we cannot restrict ourselves to computers. New communication technologies as new ways of transmitting information as well as new storage media (e.g. compact-discs) and a growing integration of the different media may affect the whole structure of training - on the job, in the classroom as well as in distant education. This development is relevant for education in general and should - restricted to the use in distant education and with training on the job - be an important topic of discussion of "subplenary 1" of the Action Group.

For the use in every-day life and professional/vocational situations, certain new demands and potentials can be found in the literature on mathematics education /cf. for instance FITZGERALD and STRAESSER/. The demands are described as growing needs for graphics (especially in commerce and administration) and geometry (for technical drawing: coordinate and spatial geometry with the use of CNC- and CAD-machines), number systems, elementary algebra, optimising, controlling, programming and algorithmic thinking, which is often accompanied by quests to train logical thinking and thinking in systems.

Detailing the professional/vocational use of these technologies, changes in geometry (connected with new tools of design and drawing techniques in the technical/constructive domains) must be mentioned. A changing relation between algorithms and holistic structures ("Gestalt") can be seen especially in business and administration. New possibilities of modelling, exploration and simulation heavily rely on the use of computers and adequate software and could compensate for the growing difficulties of training on the job because of potentially larger expenses of faults and losses of material, machines and time with training on the job. These new potentials are even looked upon as creating a new style of mathematical thinking - fostering a new sense of trial and error, exploration and "what-if"-type of mathematical practice and applications-oriented research.

2.2 Developing Countries

It is only too obvious, that distant, technical and adult education are crucial issues for developing/rural countries. What was written above may be valid for developed/industrialised countries, but has to be reconsidered for developing/rural countries. For such considerations, there is one major obstacle: studies and papers concentrating for instance on technical or distant education in developing/rural countries are nearly non-existent. To cite a more general statement of the ICME-5-proceedings: "it is ... difficult to get substantial contributions in this domain" /loc.cit., p. 140/.

As BROOMES in a paper for UNESCO put forward quite convincingly, "goal 1 of mathematics for rural development" can be formulated as "the preparation of citizens as users of mathematics", specifying the "mathematical knowledge needed (as) ... arithmetic, algebra, statistics and logic" /BROOMES 1981, pp. 51-52/. He points to the importance of the contexts mathematics is used in - thus confirming the above analysis of mathematics in working situations. The examples of GERDES in a paper on "Conditions and Strategies for Emancipatory Mathematics Education in Undeveloped Countries" show in an impressive way that the topics named by BROOMES should not be taken the way they are sometimes used in industrialised, developed countries - but must be reconsidered in the light of the needs of the society in question /cf. GERDES 1985, pp. 16-18 as an illustration of the "problemising reality" approach/.

GERDES shows an additional feature most relevant to mathematics education in rural/developing countries: A large number of nations have to alter the educational system which the former colonialist nation found appropriate. From their colonial history, a lot of those countries inherited a system devoted to elite-education, which may have been working in west-european

cultures of the 19th century. "It is quite another problem to build a system of mass education in the third world and embed mathematics education in both the school situation and the specific social and cultural contexts of that world" /ICME-5-proceedings, p. 143/. "Ethnomathematics" /as was put forward by d'AMBROSIO, for examples see GERDES, CARRAHER et.al. and SCHLIEMANN/ may be a way to determine what sort of mathematics education is in fact appropriate for a given society in a given situation. In some of the developing countries this process may even be endangered by the widespread disapproval of technical and vocational education. More generally speaking (and not only relevant to developing countries !), one has to look for institutions and means to overcome the widespread separation of mental from physical labour which often goes along with an hierarchical structure in the organisation of work and educational institutions.

3. Working Structure of the Action Group

3.1 Organisation

The structure of work of Action Group 7 "Adult, technical and vocational education" is based on four meetings of 90 minutes each. Each plenary, subplenary or subgroup has a chairperson ("chairp."), who gives a short introduction to the topic of the meeting and acts as discussion leader. Short presentations - by identified contributors ("contr.") - follow the introduction in a way that these prepared activities do not exceed 30 minutes in all. The rest of the meeting is devoted to a discussion of the topics on the agenda.

1st session:

20¦ Introduction to the structure and topics of the Action Group.
Split into three sub-groups.
Subgroup 1: Vocational/technical education
Subgroup 2: Adult education
Subgroup 3: Distant education

70¦ Work in Subgroups

2nd session:

90¦ Work in Subgroups

3rd session: (parallel)

90¦ Sub-Plenary 1 on "New Technology"
Sub-Plenary 2 on "Colleges/Polytechnics"
(pre-university tertiary education)

4th session:

45¦ Plenary work on "developing countries"
45¦ Short reports from subgroups / closing discussion

3.2 Detailed Working Structure

The working structure reflects the state of planning of AG 7 at the end of February 1988. To date, it was impossible to come to an agreement with all chairpersons and contributors named in the following part of the paper. Consequently, all names are tentative and may be altered according to congress attendance and other necessities.

Obviously, the topics mentioned in the working structure cannot be discussed all and in detail within the short time allotted to the Action Group's meetings. Within the domains given below, a choice of topics will be made for each single meeting of subgroups, subplenaries and the plenary on the basis of the expertise and interests of the contributors and congress participants attending the meeting.

Subgroup 1: Vocational/technical education
1st session:
Introduction, statements and discussion on: Mathematics in the initiation to work, including Mathematics for the youngsters searching for a job (age group 16 to 20 years). Presentations center around mathematical topics. The two-year-college is an implicit topic here.
Chairp.: Bardy (FRG)
Contr. : Shipton (UK)

2nd session:
Statements (at most three) and discussion on the use of Mathematics at/for work, preferably on technical and commercial use of Mathematics. Presentations also center around the learning/teaching method when presented for present or future vocational/professional use.
(Mathematics in in-service training and recurrent education, e.g. to secure a job, to foster job promotion etc., is discussed in subgroup 2 on adult education).
Chairp.: Straesser (FRG)
Contr. : N.N.
(3rd session (subplenaries) and 4th session (plenary) see below!)

Subgroup 2: Adult education
1st session:
Introduction, statements and discussion to Mathematics in adult education, concentrating on mathematical topics in adult education for personal development and for work.
Chairp.: N.N.
Contr. : Drouhard (F) / Jordinson (UK) / Croasdale (UK)
2nd session:
Presentations and discussion on organisational structures and the process of learning (learning theories and ways of learning) of adults.
Chairp.: Dreyfus (Israel)
Contr. : Evans (UK) / Lochhead (USA) / Paquelier (F)
(3rd session (subplenaries) and 4th session (plenary) see below!)

Subgroup 3: Distant education
1st session:
Presentation and discussion of exemplary experiences in distant education from at most two countries (e.g. New Zealand, United Kingdom). Presentations and discussion centered around the questions: How is distant education organised ? Who learns and what is learnt in distant education ?
Chairp.: N.N.
Contr. : Gallimore (UK) / Knight (NZ)

(Subgroup 3: Distant education - continued)

2nd session:
At most three presentations (e.g. from Argentina, Australia). Questions for the presentations and discussion: How does one learn in distant education ? Where and what is research in distant education and what does it tell about distant education ?
Chairp.: N.N.
Contr. : Fuller (Australia) / Rosenberg (Argentina)
(3rd session (subplenaries) and 4th session (plenary) see below!)

Subplenaries and Plenary

3rd session:
"Subplenary 1" (joining all subgroups):
Impact of new technologies on adult, technical, vocational and distant education (e.g. spreadsheets, business software etc. in commerce; CAD, CNC-machines etc. in the constructing jobs as metallwork and electricity; arithmetic in adult education taken over by computers; changes in distant education from use of new communication networks etc.).
Chairp.: N.N.
Contr. : Price (USA) / Halluin (F)
"Subplenary 2" (joining all participants interested):
Presentations and discussion on Mathematics in Colleges and Polytechnics (non-university tertiary education).
Chairp.: Rodi (USA)
Contr. : Smith (USA)

4th session: (Plenary for AG 7)
45 min.: Learning Mathematics for work/in adult education/distant education in developing countries. Topics may be:ways of organisation, "ethnomathematics" for work and every-day-life, problems from the division into highly educated persons and those nearly not formally educated, etc.
Chairp.: N.N.
Contr. : N.N.
45 min. Reports from subgroups and general debate
Presider: Rees (UK)

4. References:

D'AMBROSIO, U.: Socio-cultural bases for Mathematics education. Campinas (Unicamp) 1985. Background paper for the plenary address given at ICME 5.

BROOMES, D.: Goals of Mathematics for Rural Development. In: UNESCO (ed.) Studies in Mathematics Education., vol. 2, Paris, Morris, 1981, p. 41-59.

CARRAHER, D.W.; CARRAHER, T.N.; SCHLIEMANN, A.: Having a feel for calculations. In: Mathematics for All, Sydney (Macquarie University) August 1984 (Proceedings of the Theme Group "Mathematics for All" at ICME 5).

CHEVALLARD, Y.: La Transposition didactique. Grenoble (Pensées sauvages) 1985.

COCKCROFT-report (Committee of Inquiry into the Teaching of Mathematics in Schools): Mathematics Counts - Report of the Committee. London (HMSO) 1982.

DAMEROW, P.: Mathematikunterricht und Gesellschaft (Mathematics education and society). In: HEYMANN, H.-W. (Hrsg.) Mathematikunterricht zwischen Tradition und neuen Impulsen. Köln, Aulis, 1984, p. 9-48 (vol. 7 of "Untersuchungen zum Mathematikunterricht).

FITZGERALD, A.: New Technology and Mathematics in Employment: A Summary Report. London, Dept. of Education and Science, 1985.

GERDES, P.: Conditions and Strategies for Emancipatory Mathematics Education in Undeveloped Countries. For the Learning of Mathematics, vol.5.1, 1985, p. 15-20.

ICME-3-Proceedings: New Trends in mathematics teaching - vol. IV. Paris (UNESCO) 1979.

ICME-4-Proceedings (ed. by M. Zweng et al.): Proceedings of the Fourth International Congress on Mathematical Education (ICME 4). Boston 1983.

ICME-5-Proceedings (ed. by M. Carss): Proceedings of the Fourth International Congress on Mathematical Education (ICME 4). Boston 1986.

KNIGHT, G.: Distance education in mathematics. In: Morris, R. (ed.): Out-of-school mathematics education. Paris (Studies in mathematics education, vol. 6, UNESCO) 1987, p. 65-73.

LOVIS, F.: Broadcasting and the Open University of the United Kingdom. In: Morris, R. (ed.): Out-of-school mathematics education. Paris (Studies in mathematics education, vol. 6, UNESCO) 1987, p. 43-64.

PENGELLY, R.M.: Adult and Continuing Education in Mathematics. Paris (UNESCO) 1979, p. 85-106 (chapter V of ICME-3-Proceedings).

SCHLIEMANN, A.: Mathematics among Carpentry Apprentices: Implications for School Teaching. In: Mathematics for All, Sydney (Macquarie University) August 1984 (Proceedings of the Theme Group "Mathematics for All" at ICME 5).

STRAESSER, R.: Neue Technologien und mathematischer Unterricht in gewerblich-technischen Berufsschulen. Bielefeld (Occasional Paper No. 89 of the IDM) June 1987.

STRAESSER, R. - THIERING, J.: Mathematics in Adult, Technical and Vocational Education. Report of the Action of ICME 5. In: ICME-5-Proceedings, p. 124-132.

UNESCO 1978: Classification of information about technical and vocational education. Paris (UNESCO) 1978.

UNESCO 1978a: L'évolution de l'enseignement technique et professionnel - Étude comparative. Paris (UNESCO) 1978.

Occasional Paper des IDM

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Seeger, Falk:
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